Factoring Composite Numbers

ID: 10891

Time required
15 minutes

Activity Overview

In this activity, students will work with composite numbers to find their prime factorizations in exponent form. They will create factor trees and use division as a means to finding prime factors. An extension involving finding a common denominator for two fractions is given at the end of the activity.

Topic: From Arithmetic to Algebra

- *Prime factorization*
- *Factor tree and prime factors*
- *Prime factorization in exponent form*

Teacher Preparation and Notes

- *If an interactive white board is available, create a number sort with a Venn diagram. For example, intersecting circles for Primes and Multiples of 8. The students would be given a list of a few numbers to place into the proper part of the diagram. In this case, there would be no intersection. For another example, use Primes and Numbers less than 40. There would be quite a few possibilities for numbers contained in the intersection. (credit: Teaching Reading in Mathematics, M. Barton and C. Heiderma, 2000)*
- ***To download the student worksheet, go to education.ti.com/exchange and enter "10891" in the keyword search box.***

Associated Materials

- *FactoringCompositeNumbers_Student.doc*

Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *Priming the Numbers (TI-73 Explorer) — 8452*
- *Factors Galore C: Prime Factorization (TI-73 Explorer) — 5574*
- *The Factor Game (TI-Navigator) — 6674*
- *Prime Numbers Number Line (TI-84 Plus family) — 2511*
- *Here's Looking at Euclid (TI-Nspire technology) — 8611*

Problem 1 – A Frayer Square for *prime*

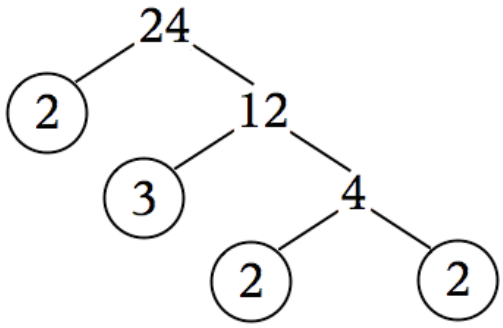
Discuss students' Frayer Squares as a class, recording their responses on the board or an overhead transparency. Use this activity to assess students' knowledge of the concepts *prime* and *composite*.

A **prime number** can be divided evenly only by itself and 1. A **composite number** is a non-zero number that is not prime.

Problem 2 – Exploring a factor tree for a composite number

Examine the factor tree of 24 with students and assess their prior knowledge of factorization and factor trees.

The number at the top of the tree is the number being factored. Moving up the factor tree represents multiplication and moving down it represents division. The circled numbers, or leaves of the tree, are prime. They make up the prime factorization.



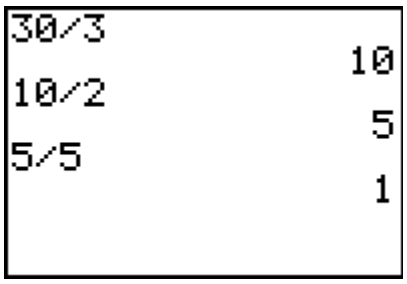
Discussion Questions:

- *What if the factor tree starts out with two different factors than the ones shown? Will you still get the same answer?* Challenge students to change the factor tree using two different starting factors.
- *Does it matter in what order I list the final prime factors? Why might a teacher prefer that the numbers be listed in ascending order?*
- *Why is the exponent form used for the prime factorization?*

Problem 3 – Exploring division as a means to finding prime factors

Demonstrate how to find the prime factorization of 30 while students follow along on their calculators. The factor trees on their worksheets help students track their progress.

Students will follow this example to complete the prime factorization and factor tree for the number 36.



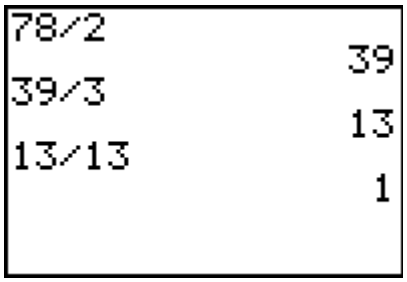
Things students can do after working through this problem:

- *How are prime factors used to create GCF and LCM? Demonstrate with an example.*
- *Explain how Eratosthenes' Sieve works to a younger student, to a peer, or to an adult.*

Possible Extension

Students can demonstrate the use of prime factors in selecting a common denominator for fraction addition or subtraction problems.

They can use either method from the activity, factor tree or division, to find the prime factorization of each denominator.



Students can use the common denominator to simplify the expressions.

$$\frac{a}{126}+\frac{a}{84}$$

$$\frac{a}{2\cdot3\cdot3\cdot7}+\frac{a}{2\cdot2\cdot3\cdot7}$$

$$\left(\frac{2}{2}\right)\frac{a}{2\cdot3\cdot3\cdot7}+\left(\frac{3}{3}\right)\frac{a}{2\cdot2\cdot3\cdot7}$$

$$\frac{2a}{2\cdot2\cdot3\cdot3\cdot7}+\frac{3a}{2\cdot2\cdot3\cdot3\cdot7}$$

$$\frac{5a}{2\cdot2\cdot3\cdot3\cdot7}=\frac{5a}{252}$$

$$\frac{5x}{78}-\frac{x}{66}$$

$$\frac{5x}{2\cdot3\cdot13}-\frac{x}{2\cdot3\cdot11}$$

$$\left(\frac{11}{11}\right)\frac{5x}{2\cdot3\cdot13}-\left(\frac{13}{13}\right)\frac{x}{2\cdot3\cdot11}$$

$$\frac{55x}{2\cdot3\cdot11\cdot13}-\frac{13x}{2\cdot3\cdot11\cdot13}$$

$$\frac{42x}{2\cdot2\cdot11\cdot13}=\frac{42x}{858}=\frac{7x}{143}$$

$$\frac{n}{30}-\frac{n}{63}$$

$$\frac{n}{2\cdot3\cdot5}+\frac{n}{3\cdot3\cdot7}$$

$$\left(\frac{3\cdot7}{3\cdot7}\right)\frac{n}{2\cdot3\cdot5}+\left(\frac{2\cdot5}{2\cdot5}\right)\frac{n}{3\cdot3\cdot7}$$

$$\frac{21n}{2\cdot2\cdot3\cdot3\cdot7}+\frac{10n}{2\cdot2\cdot3\cdot3\cdot7}$$

$$\frac{31n}{2\cdot3\cdot3\cdot5\cdot7}=\frac{31n}{630}$$

Solutions – Student Worksheet

Problem 1

Definition:	**Fun facts:**
• a number greater than 1 that... has only one pair of factors, 1 and itself.	• 2 is the only even prime. • 1 is NOT a prime • Eratosthenes came up with a "sieve" to find the primes.
Examples	**Non-examples**
• 2, 3, 5, 7, 11, 13	• –7, 0, 1, 4, 12, 100

Problem 2

- The exponent is three because there are three 2s.
- The number 24 is not a prime number because it has factors other than 1 and itself.

Problem 3

- There are no exponents in this example because there is only one of each factor.
- $36 = 2^2 \cdot 3^2$; factor tree will vary

Problem 4

Factor trees will vary.

1. $27 = 3^3$

2. $56 = 2^3 \cdot 7$

3. $72 = 2^3 \cdot 3^2$